A Survey of the Aphodiinae, Hybosorinae and Scarabaeinae (Coleoptera: Scarabaeidae) from Small Wet Forests of coastal New South Wales, Part 4: Lansdowne State Forest

By G. A. Williams and T. Williams*

Abstract

Records of Aphodiinae, Hybosorinae and Scarabaeinae from a variety of forest types in the Lansdowne State Forest and several associated forest systems are listed. Data includes dates of collection, numbers of individuals encountered, vegetation and soil type at each study site, groundcover and bait type or collection method used. Range extensions are listed for several species. The occurrence of partial carpophagy (fruit eating) within the broad foraging strategy of *Onthophagus dunningi* Harold is noted.

Introduction

Part 4 of this survey is restricted to Lansdowne State Forest and several adjoining and associated forest systems. The area covered is situated approximately 16 km north of Taree, on the New South Wales north coast, and closely approaches the Comboyne Plateau to the northwest and Yarratt State Forest to the west (see Parts 2 and 3 Williams and Williams 1983a, 1983b).

Lansdowne State Forest, together with Coopernook State Forest to the southeast, constitute the Manning River National Forest; an area of approximately 7,000 hectares. The forest runs diagonally from Coopernook in the southeast to the northwest and in so doing rises from an altitude of 20 metres above sea level to over 500 metres. In the southwest the forest boundary is formed by a distinct uplift cliff face (Plate 1.) that, from the air appears as a sharply delimited scar. From this southwest cliff scar the forest drops away more gently to the northeast.

Primarily a hardwood forest, Lansdowne State Forest contains a variety of wet forest types, both gully restricted and in more spatially expansive tracts formed along slopes. Rainforest types are common, occurring either as pure stands or as a substantial understorey in wet sclerophyll forest. Subtropical palm forests also occur in the central sector of the forest. These are dominated by Bangalow Palms, *Archontophoenix cunninghamiana* (Wendl.) Wendl. et Drude, with the Walking Stick Palm, *Linospadix monostachyus* (Mart.) Wendl. occuring commonly on the forest floor.

Extending out from the state forest are a number of forests on private farmland and the extent of these, and the disposition of the study sites, are illustrated in Figure 1.

Eleven sites were sampled comprising a variety of vegetation types as well as a variety of land tenures. Sites A, B, C, D, F, G and H are contained within state forest whilst sites E, I, J are on private freehold land. Site K is restricted to a roadside easement. (Plates 2, 3.) Of these sites four were chosen for their comparative differences in vegetation status; site H was essentially a dry sclerophyll community with a venturesome wet forest component, site I is a wet sclerophyll forest regrowth interspersed with grassed areas whilst site J is a *Melaleuca-Eucalyptus-Callistemon* community associated with a small and shallow run-off gully. This site has a number of wet forest genera interspersed along the margins and within the understorey but most species are represented only by one or two individuals. Site K is composed mostly of "rainforest" species but the plant community is restricted almost totally to the creek and banks, an area rarely exceeding a width of 6 metres. In addition, the site is frequently inundated during heavy or continual rainfall. Sites J and K are now isolated from the main forest system and represent relict communities remaining after agricultural clearing. All of the study sites suffer from the establishment of introduced *Lantana camara*

* c/o Post Office, Lansdowne via Taree, N.S.W. 2430

Figure 1. Map of study sites.
A. Starr's Creek, Lansdowne S. F.
B. Newby's Creek "cave", Lansdowne S. F.
C. Pipeclay Creek Road, Lansdowne S. F.
D. Langley Vale Road, Lansdowne S. F.
E. Newby's Lane (rainforest).
F. Newby's Lane (wet scler. forest), Lansdowne S. F.
G. Newby's Lane (wet scler. forest), Lansdowne S. F.
H. Newby's Lane (dry scler. forest), Lansdowne S. F.
I. Newby's Lane (wet scler. forest regrowth).
J. Newby's Lane (dry scler. association).
K. Newby's Lane (rainforest/wet scler. forest association).

L. Verbenaceae, along both the site margins and as a component of the understorey where the forest canopy is open or disturbed.

The methods for capturing the beetles and the general presentation of data follows that for previous Parts (Williams and Williams 1982, 1983a, 1983b) though in this part little attempt was made to offer a variety or choice of pit-trap baits. There are no previous records of dung beetles from forest communities of the area.

As an adjunct to the main study some specific studies into possible carpophagy in the dung beetle *Onthophagus dunningi* Harold were carried out at site I. These results are tabled (Table 3) and discussed separately at the end of the main discussion.

The location of the study sites is figured (Fig. 1) and an indication of Lansdowne State Forest, in relation to Yarratt State Forest (Pt. 3) and the Comboyne Plateau (Pt. 2), is given (Fig. 2).

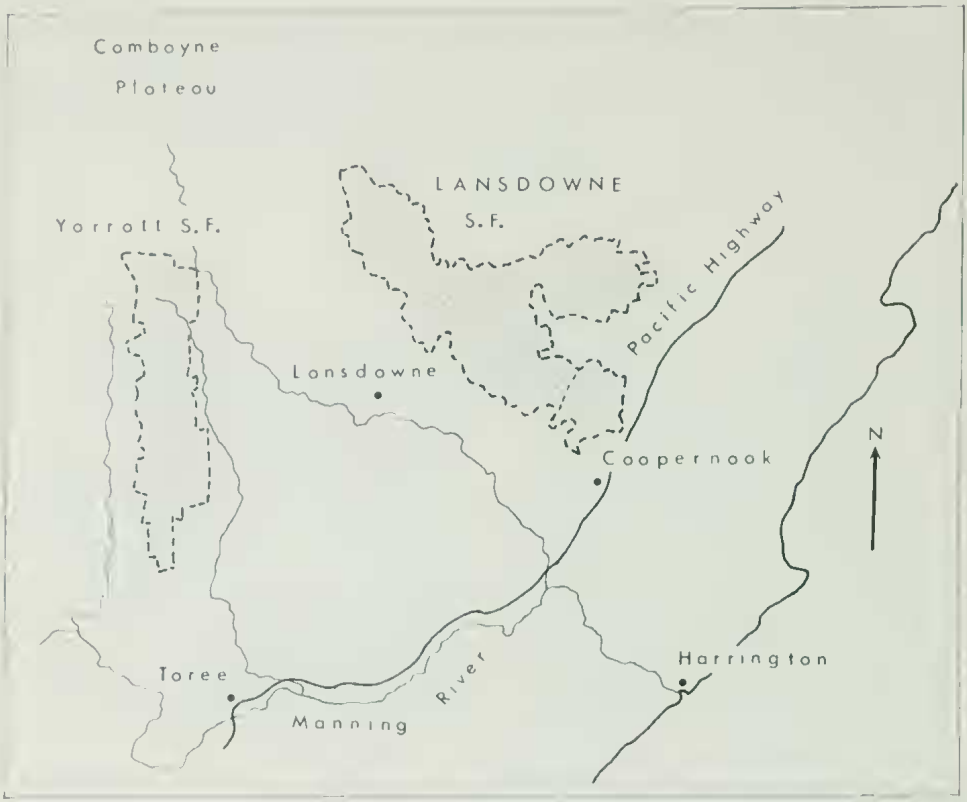

Figure 2. Map of Lansdowne State Forest indicating proximity to Yarratt State Forest (in Part 3) and the Comboyne Plateau (in Part 2).

Table 1. List of study sites and species taken at each. (Dates of collection are followed by figures in parenthesis indicating numbers of specimens taken.)

A. Starr's Creek Picnic Area (alt. 400 m). Subtropical-warm temperate rainforest association along creek gully. Red brown clay-loam with moderate leaf litter cover.

Liparochrus silphoides Harold. 5.ii.1981,(1), at faeces.

Diorygopyx incrassatus Matthews. 5.ii.1981,(3), at faeces.

Onthophagus kiambram Storey. 5.ii.1981,(12), at faeces.

Onthophagus pugnax Harold. 5.ii 1981,(3), at faeces.

Onthophagus sydneyensis Blackburn. 5.ii.1981,(3), at faeces.

B. Newby's Creek "Cave" (alt. 260 m). Small gully restricted rainforest within dry sclerophyll forest regrowth. Dark brown sandy loam with heavy leaf litter cover. (see Plate 3.)

Liparochrus silphoides Harold. 5.ii.1981,(1), at faeces.

Amphistomus speculifer Matthews. 17.xi.1980,(1), at faeces.

Diorygopyx incrassatus Matthews. 19.x.1980,(5); 17.xi.1980,(5); 5.ii.1981,(6), at faeces.

Lepanus bidentatus (Wilson). 17.xi.1980,(1); 5.ii.1981,(1), at faeces.

Onthophagus sydneyensis Blackburn. 19.x.1980,(1); 5.ii.1981,(1), at faeces.

C. Pipeclay Creek Road (alt. 60 m). Subtropical palm forest surrounded by wet sclerophyll forest. Light brown loam soil with light density leaf litter cover.

Liparochrus silphoides Harold. 21.x.1980,(2); 17.xi.1980,(1); 5.ii.1981,(1), at faeces.

Diorygopyx incrassatus Matthews. 21.x 1980,(8); 5.ii.1981,(3), at faeces.

Lepanus politus (Carter). 5.ii.1981,(1), at bird dropping.

Lepanus ustulatus (Lansberge). 19.x.1980,(1), at faeces.

Plate 1. Section of southwest cliff face of Lansdowne State Forest above sites J and K.

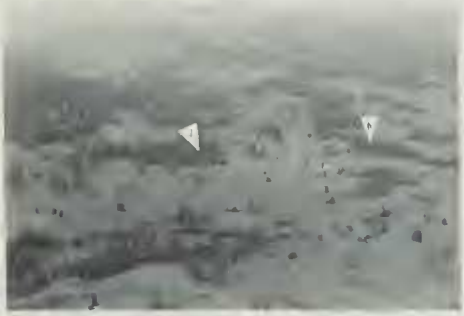

Plate 2. Sites J and K showing degree of forest reduction in surrounding farmlands.

Plate 3. Gully restricted rainforest at Site B.

Onthophagus bornemisszai Matthews. 18.xi.1980,(1), in marsupial droppings on edge of palm forest and adjoining wet sclerophyll forest.
Onthophagus capella Kirby. 18.xi.1980,(1), in marsupial droppings on edge of palm forest and adjoining wet sclerophyll forest.
Onthophagus kiambram Storey. 5.ii.1981,(8), at faeces.
Onthophagus sydneyensis Blackburn. 5.ii.1981,(3), at faeces.
Onthophagus sydneyensis Blackburn ? 21.x.1980,(1), at faeces.

D. Langley Vale Road; previously known as Rocky Creek Road (alt. 40 m). Gully rainforest established under emergent wet sclerophyll forest elements. Brown sandy loam soil with heavy leaf litter cover.
Liparochrus fossulatus Westwood. 19.x.1980,(1), at faeces.
Lepanus bidentatus (Wilson). 17.xi.1980,(2), at faeces.
Lepanus bidentatus (Wilson) ? 17.xi.1980,(1), at faeces.
Onthophagus capella Kirby. 17.xi.1980,(1), at faeces.
Onthophagus kiambram Storey. 24.xii.1977,(2); 17.xi.1980,(3); 5.ii.1981,(1), at faeces.
Onthophagus sydneyensis Blackburn. 27.x.1978,(2); 17.xi.1980,(1), at faeces.

E. Newby's Lane (alt. 50 m). Warm temperate-subtropical rainforest association developed along creek and escarpment. Dark brown loam/sandy loam with light to heavy leaf litter cover.
Ataenius picinus Harold. 16.ix.1978,(1), at cow manure.
Liparochrus silphoides Harold. 10.ii.1980,(7); 19.x.1980,(1); 19.xi.1980,(10); 10.iv.1981,(6), at faeces.
Amphistomus speculifer Matthews. 19.x.1980,(2); 16.xi.1980,(2), at faeces.
Diorygopyx incrassatus Matthews. 19.x.1980,(1); 10.i.1981,(1), at faeces.
Lepanus bidentatus (Wilson). 19.x.1980,(1); 10.i.1981,(1), at faeces.
Lepanus ustulatus (Lansberge). 12.i.1981,(2); 10.ii.1981,(1), at faeces.
Onthophagus bornemisszai Matthews. 1.xii.1979,(2); 12.i.1981,(1), at faeces and in wallaby droppings.
Onthophagus kiambram Storey. 26.x.1978,(2); 24.ix.1980,(3); 19.x.1980,(1); 12.i.1981,(11); 10.ii.1981,(3), at faeces.
Onthophagus capella Kirby. 10.i.1981,(1), at faeces.
Onthophagus neostenocerus Goidanich. 10.ii.1980,(2), at faeces.
Onthophagus pugnax Harold. 10.ii.1980,(1), at faeces.
Onthophagus sydneyensis Blackburn. 10.ii.1981,(2); 10.iv.1981,(1), at faeces.

F. Newby's Lane (alt. 40 m). Wet sclerophyll forest restricted to shallow run-off gully, adjoining site E to the north. Brown loam soil, leaf litter removed in forest floor fire in August 1980 prior to the initiation of sampling.

Ataenius imparilis Blackburn. 15.xi.1980,(1), at faeces.

Liparochrus fossulatus Westwood. 23.ix.1980,(2), at faeces.

Lepanus australis Matthews. 10.iv.1981,(2), at faeces.

Lepanus ustulatus (Lansberge). 12.i.1981,(1); 7.ii.1981,(1); 13.x.1981,(2), at faeces.

Notopedaria sylvestris Matthews. 12.i.1981,(1); 7.ii.1981,(2); 11.ii.1981,(8); 13.x.1981,(1), at faeces.

Onthophagus bornemisszai Matthews. 12.i.1981,(3); 10.ii.1981,(1), at faeces.

Onthophagus capella Kirby. 12.i.1981,(9); 7.ii.1981,(5), at faeces.

Onthophagus incornutus Macleay. 26.x.1980,(1), at light.

Onthophagus kiambram Storey. 23.ix.1980,(1), at faeces.

Onthophagus nurubuan Matthews ? 12.i.1981,(1), at faeces.

Onthophagus leanus Goidanich. 8.ii.1981,(1), at faeces.

Onthophagus pugnax Harold. 12.i.1981,(1); 8.ii.1981,(1), at faeces.

Onthophagus sydneyensis Blackburn. 12.i.1981,(8); 10.iv.1981,(1), at faeces.

G. Newby's Lane (alt. 40 m). Wet sclerophyll forest adjoining site H to the south and site I to the north. Dark brown loam soil with medium to heavy leaf litter cover. This site was partially logged in July 1981 which resulted in considerable disturbance to the forest floor but with a canopy reduction of less than 40%.

Liparochrus fossulatus Westwood. 16.xi.1980,(1), at faeces.

Aulacopris maximus Matthews. 23.x.1980,(1), at faeces.

Diorygopyx incrassatus Matthews. 23.x.1980,(1), at faeces.

Lepanus australis Matthews. 10.iv.1981,(2); 4.i.1983,(1), at faeces.

Lepanus ustulatus (Lansberge). 14.i.1981,(3), at faeces.

Notopedaria sylvestris Matthews. 23.x.1980,(2), at faeces.

Onthophagus auritus Erichson. 4.i.1983,(1), at faeces.

Onthophagus capella Kirby. 16.xi.1980,(2); 4.i.1983,(5), at faeces.

Onthophagus sydneyensis Blackburn. 5.ii.1981,(1); 10.iv.1981,(1), at faeces.

H. Newby's Lane (alt. 40 m). Dry sclerophyll forest with some venturesome "wetter" elements. Brown-grey clay loam soil with medium to light leaf litter cover. Partially logged in July 1981 with only light, or locally heavy disturbance (eg. roading and log dumps), to the site.

Liparochrus fossulatus Westwood. 12.iv.1981,(2); 4.i.1983,(1), at faeces.

Lepanus australis Matthews. 12.iv.1981,(1); 18.iv.1981,(1), at faeces.

Notopedaria sylvestris Matthews. 26.x.1980,(9); 5.ii.1981,(7); 12.iv.1981,(2); 19.iv.1981,(15), at faeces.

Onthophagus auritus Erichson. 18.iv.1981,(2); 4.i.1983,(1), at faeces.

Onthophagus bornemisszai Matthews. 18.ix.1982,(1), in marsupial dropping.

Onthophagus capella Kirby. 5.ii.1981,(2); 10.iv.1981,(11); 19.iv.1981,(6); 4.i.1983,(2), at faeces and cow manure.

Onthophagus dunningi Harold. 12.iv.1981,(2), at faeces.

Onthophagus granulatus Boheman. 20.xi.1980,(1), in marsupial dropping.

Onthophagus gazella (Fab.). 10.iv.1981,(1), at cow manure but common in adjoining pasture.

Onthophagus nurubuan Matthews ? 10.iv.1981,(2); 17.iv.1981,(1), at faeces.

Onthophagus leanus Goidanich. 12.iv.1981,(1); 8.x.1982,(2); 15.xi.1982,(1), at faeces and cow manure.

Onthophagus tweedensis Blackburn. 8.x.1982,(1), under cow manure.

I. Newby's Lane (alt. 40 m). Partially cleared and regenerating wet sclerophyll forest adjoining site E (raintorest) and sites F and G (wet sclerophyll forest). Brown loam soil.

Aphodius frenchi Blackburn. 23.vi.1982,(4), at marsupial droppings.

Ataenius picinus Harold. 26.x.1980,(2); 15.xi.1980,(3); 4.i.1981,(1); 11.i.1981,(4), at u/v light.

Ataenius tweedensis Blackburn. 4.i.1981,(1), at u/v light.

Proctophanes sculptus Hope. 15.x.1977,(5); 16.ix.1978,(3), at cow manure.

Liparochrus fossulatus Westwood. 5.x.1980,(1); 25.viii.1982,(2); 29.x.1982(1), flying during day and at carrion (*Rattus fuscipes* (Waterhouse) (Muridae: Rodentia) and *Antechinus* sp. (Dasyuridae: Marsupialia)).

Monoplistes leai Paulian. 13.ix.1980,(1); 19.iv.1982,(1), at light.

Onthophagus auritus Erichson. 1.xii.1982,(3), at faeces.

Onthophagus capella Kirby. 10.xii.1978,(1); 18.iv.1981,(1) at faeces.

Onthophagus depressus Harold. 4.i.1981,(1), at u/v light.

Onthophagus dunningi Harold. 19.iv.1981,(5), at rotting watermelon; 6.v.1981,(1), found on ground.

Onthophagus leanus Goidanich. 21.iv.1979,(1); 4.xii.1980,(2), at light and cow manure.

Onthophagus nurubuan Matthews. 12.i.1981,(1); 14.iv.1981,(2), at cow manure.
Onthophagus pugnax Harold. 10.xii.1978,(1); 21.ix.1979,(1), at faeces and cow manure.
Onthophagus sydneyensis Blackburn. 16.ix.1979,(4), at wallaby droppings and cow manure.
Onthophagus tweedensis Blackburn. 23.xii.1977,(1), at wallaby droppings.

J. Newby's Lane (alt. 30 m). Dry sclerophyll association, restricted to shallow, seasonally dry, run-off gully. Some "wetter" forest spp. as venturesome component of understorey and margins. Light brown clay loam, open grazed forest floor. Surrounded by pasture.
Lepanus australis Matthews. 4.i.1983,(1), at faeces.
Onthophagus capella Kirby. 4.i.1983,(3), at faeces.

K. Newby's Lane (alt. 20 m). Narrow, creek-restricted, rainforest/wet sclerophyll association; seasonally inundated. Dark brown sandy loam. Surrounded by pasture.
* No spp. encountered over 5 sampling visits.

Table 2. Summary of species encountered.
(Letters indicate study sites; where indicated, specimens lodged in Australian National Insect Collection, Canberra)

Family Scarabaeidae.
Subfamily Aphodiinae.
Aphodius frenchi Blackburn. I.
Ataenius imparilis Blackburn. F.
Ataenius picinus Harold. E, I. Specimen in A.N.I.C.
Ataenius tweedensis Blackburn. I.
Proctophanes sculptas Hope. I. Specimen in A.N.I.C.

Subfamily Hybosorinae.
Liparochrus fossulatus Westwood. D, F, G, H, I. Specimen in A.N.I.C.
Liparochrus silphoides Harold. A, B, C, E. Specimen in A.N.I.C.

Subfamily Scarabaeinae.
Tribe Onthophagini.
Onthophagus auritus Erichson, G, H, I, Specimen in A.N.I.C.
Onthophagus bornemisszai Matthews, C, E, F, H. Specimen in A.N.I.C.
Onthophagus capella Kirby, C, D, E, F, G, H, I, J. Specimen in A.N.I.C.
Onthophagus depressus Harold. I. Specimen in A.N.I.C.
Onthophagus dunningi Harold, H, I. Specimen in A.N.I.C.
Onthophagus gazella (Fab.). H.
Onthophagus granulatus Boh. H.
Onthophagus incornatus Macleay. F.
Onthophagus kiambram Storey. A, C, D, E, F. Specimen in A.N.I.C.
Onthophagus leanus Goidanich. F, H, I. Specimen in A.N.I.C.
Onthophagus neostenocerus Goidanich. E.
Onthophagus nurubuan Matthews. I.
Onthophagus nurubuan Matthews? F, H. Specimen in A.N.I.C.
Onthophagus pugnax Harold. A, E, F, I. Specimen in A.N.I.C.
Onthophagus sydneyensis Blackburn. A, B, C, D, E, F, G, I. Specimen in A.N.I.C.
Onthophagus sydneyensis Blackburn ? C. Specimen in A.N.I.C.
Onthophagus tweedensis Blackburn. H, I. Specimen in A.N.I.C.

Tribe Scarabaeini.
Amphistomus speculifer Matthews. B, E. Specimen in A.N.I.C.
Aulacopris maximus Matthews. G.
Diorygopyx incrassatus Matthews. A, B, C, E, G. Specimen in A.N.I.C.
Lepanus australis Matthews. F, G, H, J. Specimen in A.N.I.C.
Lepanus bidentatus (Wilson). B, D, E.
Lepanus bidentatus (Wilson) ? D. Specimen in A.N.I.C.
Lepanus politus (Carter). C.
Lepanus ustulatas (Lansberge). C, E, F, G. Specimen in A.N.I.C.
Monoplistes leai Paulian. I.

Tribe Coprini.
Notopedaria sylvestris Matthews. F, G, H. Specimen in A.N.I.C.

Discussion

The main period of sampling in this Part was undertaken between September 1980 and December 1982. Though the annual rainfall for the survey area is normally high (median annual rainfall of between 1400–1600 mm) three periods of excessive drought conditions coincided with the sampling period; spring and summer 1980, winter 1981 and late spring and early summer of 1982. Presumably these drought periods adversely affected the frequency with which the beetles occurred within the environment. However, during the total study, it has frequently been the case that light to heavy rainfall has occurred during sampling and on occasion rain continual-

ly fell whilst the pit-traps were in position. Rather than lessen catch returns in the traps, and as long as cool temperatures did not coincide with the rainfall, both the variety of species and the number of individuals taken were relatively rich. Thus a relative increase in moisture availability in both the soil and leaf litter cover may in some way act as an environmental stimulus to increased beetle activity.

The relict forest communities at sites J and K were sampled on 5 occasions (30 August 1982, 29 September 1982, 20 October 1982, 29 November 1982 and 2 January 1983) but only on the 2 January 1983, at site J, were any beetles taken. Neither of the 2 species collected at site J, on this last sampling, can be considered as purely wet forest species. *Onthophagus capella* Kirby is normally an inhabitant of more open habitats (Matthews 1972) whilst *Lepanus australis* Matthews appears to be capable of entering wet-dry forest interfaces limited possibly in its mobility by fluctuations in environmental moisture availability.

The apparent absence of a resident wet forest fauna over the 5 sampling periods at site K is not surprising given the physical restraints to site occupation. The site is very narrow and is subject to frequent inundation with no adjoining elevated forest areas available for temporary dispersal by the beetle community.

Only *Onthophagus sydneyensis* Blackburn was common to all the wet forest sites whilst *Notopedaria sylvestris* Matthews, which was encountered at wet and dry sclerophyll sites at Newby's Lane, was also taken in pasture adjoining sites G and H during and immediately after periods of heavy or continual rainfall.

Within the study area *Diorygoprix asciculifer* Matthews is replaced by the closely related *D. incrassatus* Matthews with *D. incrassatus* (previously recorded only from the Hastings River valley and the Comboyne Plateau) actually entering the Manning valley at 2 of the study sites (I and G). With the exception of a single individual taken at site G, in wet sclerophyll forest, *D. incrassatus* was restricted to rainforest.

The 2 hybosorines, *Liparochrus sulphoides* Harold and *L. fossulatus* Westwood, are apparently mutually exclusive with *L. sulphoides* occupying pure rainforest sites whilst the more mobile *L. fossulatus* occupies sclerophyll sites or wet sclerophyll-rainforest associations.

Several records are of additional interest. The occurrence of *Lepanus ustulatus* (Lansberge) represents a significant range extension southwards from the MacPherson Range on the Queensland border (Matthews 1974) whilst the occurrence of *Aulacopris maximus* Matthews at site G (elevation 40 m) is the first non-montane record for the species. The species was also taken at a submontane gully rainforest in Buladelah State forest to the south (Williams and Williams 1983b).

The genus *Aptenocanthon* does not penetrate to this study area though it is common at higher altitudes immediately to the west (Williams and Williams 1983a), nor does *Amphistomus primonactus* Matthews which was common both on the Comboyne Plateau and the Dingo Tops (Williams and Williams *loc.cit.*).

Feeding Behaviour of *Onthophagus dunningi* Harold

In Australia, endemic dung beetles of the tribe Onthophagini number 170 described species and all of these are placed in a single genus, *Onthophagus* (Matthews 1972). Most species are coprophagous whilst a significant element of the fauna (10 spp.) have been collected in association with agaric fungi (Matthews *loc.cit.*), though not all are necessarily obligate mycetophages. Only *Onthophagus vilis* Harold had previously been recorded, amongst the Australian fauna, as exhibiting carpophagous habits (Monteith and Storey 1981) but during the main study (though incidental to it) we took a number of *Onthophagus dunningi* Harold adults in a watermelon baited trap, set in wet sclerophyll forest regrowth at site I. The species had not previously been known to exhibit even partial carpophagous (fruit eating) habits.

O. dunningi is known from coastal sclerophyll forests from eastern Victoria to southern Queensland. In addition to being taken at toadstools and mushrooms the species is also found in excrement and entrails though Bornemissza (1971) has shown that adult *O. dunningi* appear to utilize only toadstools and mushrooms in the provisioning of their broods.

On the 19 April 1981, 5 adult *O. dunningi* (comprising both males and females) were

collected in a watermelon baited trap as mentioned previously. The trap consisted of a glass jar positioned above ground (13 cm high with a mouth width of 7.5 cm) over which was suspended an inverted aluminium pie dish. This configuration afforded a width of *ca.* 2 cm between jar mouth and dish edge for any insects to gain entry and was originally intended for the collection of Diptera. The height of the trap would have negated any possibility of incidental entry by the beetles.

In an attempt to gain some insight into the frequency with which carpophagy occurs in *O. dunningi*, two parallel trap lines, consisting of traps similar to the one mentioned above, were positioned at the original capture site on 21 March 1982. Each trap line consisted of five traps so that each of the following bait types were duplicated and offered simultaneously: chicken bones, faeces, mushrooms, watermelon and water (as a control). The individual baits were weighed to an approximate wet weight of 25–30 grams and once positioned were examined each day. The chicken bone and excrement baits were removed by a goanna, *Varanus varius* (Shaw) after 2–5 days, and the mushroom baited traps were removed on the 6th day by the authors. The melon baits were not removed until the observations were concluded on the 13th day. The results are shown in Table 3. Though *O. dunningi* adults were collected at chicken bones and mushrooms none were captured in melon baited traps.

Concurrently with this brief field study, several *O. dunningi* adults were placed into a large ventilated perspex container into which had been put a large watermelon segment and a damp wad of cottonwool. They were examined several times each day and night over a period of 7 days. The beetles rested beneath the cottonwool during daytime and each night actively fed upon the rotting melon.

It would appear from these observations that *Onthophagus dunningi* is a generalist feeder (when not brood provisioning), exhibiting low frequency carpophagous habits as part of its feeding strategy.

Table 3. Dung beetles trapped at simultaneously offered bait types.
(Letters indicate species, numerals indicate no. of individuals)

Bait Type	Trap Line	Day 1	2	3	4	5	6	7	8	9	10-13	
Chicken bones	a	0	A2	*								
	b	0	B6	B6	B5	*						
Faeces	a	0	B2 C1 D1	B1 D1	*							
	b	0	0	0	B1	0	*					
Watermelon	a	0	0	0	0	0	0	0	0	0	0	0
	b	0	0	0	0	0	0	0	B1	B2	0	0
Mushrooms	a	0	0	0	A1	0	A1	**				–
	b	0	A1 B1	A2	A1	0	0	**				
Water (control)	a	0	0	0	0	0	0	0	0	0	0	0
	b	0	0	0	0	0	0	0	0	0	0	0

A. *Onthophagus dunningi*. B. *Liparochrus fossulatus*. C. *Notopedaria sylvestris*. D. *Aulacopris maximus*.

* Trap disturbed and bait removed by *Varanus varius*

** Trap removed by author.

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